

REMARKS

This application has been carefully reviewed in light of the Office Action dated April 24, 2001. Claims 1 to 18 and 40 to 41 are in the application, with Claims 19 to 39 having been cancelled without prejudice or disclaimer of the subject matter contained therein, and without conceding the correctness of the rejections. Claims 1 and 12 are the independent claims. Reconsideration and further examination are respectfully requested.

The drawings were objected to for allegedly failing to show a detection optical element and a second lens being integrally formed. This objection is traversed, however, since it is believed that Figure 9 shows these features. As can be seen in Figure 9, and as described on page 27, lines 2 to 7, of the specification, a detecting optical element and a second lens are integrally formed. Accordingly, withdrawal of the objection to the drawings is respectfully requested.

The Abstract Of The Disclosure was objected to for informalities. The Abstract has been rewritten to improve the terminology used. Accordingly, withdrawal of this objection is respectfully requested.

Claims 1 to 18 were rejected under 35 U.S.C. § 112, second paragraph, for alleged indefiniteness. In response, the claims have been reviewed and amended to improve clarity and address those points raised in the Office Action. Accordingly, reconsideration and withdrawal of the § 112 rejection of Claims 1 to 18 are respectfully requested.

Claims 1 and 11 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,950,889 (Budd); Claims 2, 4, 8, 9, 12, 14 and 18 were rejected under § 103(a) over Budd in view of U.S. Patent No. 5,365,259 (Kanoto); Claims 3, 10 and 13 were rejected under § 103(a) over Budd in view of Kanoto and further in view of U.S. Patent No. 5,963,356 (Kato); and Claims 5 to 7 and 15 to 17 were rejected under § 103(a) over Budd in view of Kanoto and further in view of U.S. Patent No. 6,124,962 (Kamikubo). Applicant has carefully considered the Examiner's remarks and the cited references and respectfully submits that the claims herein are patentably distinguishable over the cited art for at least the following reasons.

The present invention concerns multibeam scanning optical apparatuses in which a photodetector controls the timing of the start of scanning of multiple light beams by detecting a part of the light beams deflected by a light deflector. According to the invention, the timing is controlled so that the centers of the scanning areas of the light beams are aligned. By controlling the timing in this manner, the variations in scanning caused by the light beams having differing wavelengths are reduced.

With reference to the claim language, independent Claim 1 concerns a multibeam scanning optical apparatus that includes a light source having a plurality of light beam emitting sections, a light deflector for deflecting a plurality of light beams emitted respectively from the plurality of light beam emitting sections of the light source, and a scanning optical system for focussing the plurality of light beams deflected by the light deflector on a surface to be scanned. The apparatus also includes a photodetector for controlling a timing of a start of scanning of the plurality of light beams by detecting a part of the plurality of light beams deflected by the light deflector as detection light beams. The

timing of the start of scanning is controlled to align the centers of scanning areas of the light beams with each other on the surface to be scanned while allowing starting points of scanning of said light beams to differ from each other when the plurality of light beams have respective wavelengths that are different from each other.

The applied art of record is not understood to disclose the foregoing features of the present invention. In particular, the applied art is not understood to disclose at least the feature of controlling the timing of the start of scanning to align the centers of scanning areas of light beams with each other on a surface to be scanned while allowing the starting points of scanning of the light beams to differ from each other.

Specifically, Budd concerns compensating for errors between scan lines in a multiple beam laser scanning system. Using signals designating the start and end of scanning, Budd compensates for chromatic aberration and misalignment of the scan lines. In performing the compensation, the scan lines are shifted, expanded or contracted in order to align them with each other and have them start and stop at the same points. However, Budd does not teach allowing the starting points of scanning of light beams to differ from each other; in fact Budd adjusts them so they are the same. Therefore, Budd is not understood to disclose controlling the timing of the start of scanning to align the centers of scanning areas of light beams with each other on a surface to be scanned while allowing the starting points of scanning of the light beams to differ from each other.

Accordingly, Claim 1 is believed to be allowable over the applied art of record. Reconsideration and withdrawal of the § 102(b) rejection of Claim 1 are respectfully requested.

Independent Claim 12 concerns a multibeam scanning optical apparatus that includes a light source having a plurality of light beam emitting sections, a light deflector for deflecting a plurality of light beams emitted respectively from the plurality of light beam emitting sections of the light source, and a scanning optical system for focussing the plurality of light beams deflected by the light deflector on a surface to be scanned. The apparatus also includes a photodetector for controlling a timing of a start of scanning of the plurality of light beams by detecting a part of the plurality of light beams deflected by the light deflector as detection light beams, and a detection optical element for converging the detection light beams and leading them to the photodetector. The detection optical element has its optical surfaces arranged orthogonally relative to the detection light beams.

The applied art of record is not understood to disclose or suggest the foregoing features of the present invention. In particular, the applied art is not understood to disclose or suggest at least the feature of a detection optical element for converging detection light beams and leading them to a photodetector where the detection optical element has its optical surfaces arranged orthogonally relative to the detection light beams.

Specifically, Budd is not understood to disclose or suggest a detection optical element for converging detection light beams and leading them to a photodetector. Therefore, Budd is not understood to disclose or suggest a detection optical element for converging detection light beams and leading them to a photodetector where the detection optical element has its optical surfaces arranged orthogonally relative to the detection light beams.

Kanoto is not seen to disclose or suggest anything to remedy the foregoing deficiencies of Budd. Kanoto concerns a scanning optical device in which a single laser

beam passes through a condenser lens prior to reaching a photosensor. However, Kanoto is not seen to disclose or suggest the optical surfaces of the condenser lens being arranged orthogonally relative to the single laser beam. Additionally, since Kanoto only concerns an apparatus utilizing a single laser beam, Kanoto is not seen to disclose or suggest the condenser lens converging multiple light beams. Therefore, Kanoto is not seen to disclose or suggest a detection optical element for converging detection light beams and leading them to a photodetector where the detection optical element has its optical surfaces arranged orthogonally relative to the detection light beams.

Kato and Kamikubo, which were applied in the rejections of certain dependent claims, are not seen or understood to disclose or suggest anything to remedy the foregoing deficiencies of Budd and Kanoto.

Accordingly, independent Claim 12 is believed to be allowable over the applied art. Reconsideration and withdrawal of the § 103(a) rejection of Claim 12 are respectfully requested.

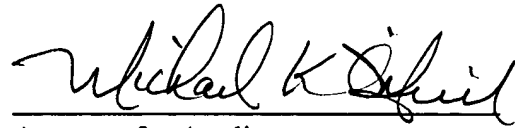
The other claims in this application are each dependent from the independent claims discussed above and are believed to be patentable for the same reasons. Because each dependent claim is deemed to define an additional aspect of the invention, however, the individual consideration of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, the entire application is believed to be in condition for allowance, and such action is respectfully requested at the Examiner's earliest convenience.

Applicant's undersigned attorney may be reached in our Costa Mesa,
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Respectfully submitted,

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CA_MAIN 31319 v 1



Application No.: 09/522,294
Attorney Docket No.: 35.C14341

APPENDIX I

VERSION WITH MARKINGS TO SHOW CHANGES MADE TO
ABSTRACT OF THE DISCLOSURE

A multibeam scanning optical apparatus [comprises] having a light source, [an incident optical system,] an optical deflector, a scanning optical system, a detection optical element, and a photodetector. A plurality of light beams modulated in accordance with information signals are emitted from the light source and lead to the optical deflector[, typically a rotary polygon mirror, by way of the incident optical system, typically a collimator lens and a cylindrical lens]. The light beams deflected by the optical deflector are then focussed on a surface to be scanned, typically a photosensitive drum, by way of the scanning optical system having an $f\theta$ characteristic. Part of the deflected light beams are lead to the photodetector by a way of the detection optical system in order to control the timing of the start of scanning so that the centers of the scanning areas of the plurality of light beams agree with each other on the surface to be scanned. [In case of a color image forming apparatus comprising a plurality of scanning optical apparatus the above control scheme can be applied even when the scanning optical apparatus have a single beam light source.]

CA_MAIN 31444 v 1



Application No.: 09/522,294
Attorney Docket No.: 35.C14341

APPENDIX II

VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS

1. (Amended) A multibeam scanning optical apparatus comprising:

a light source having a plurality of light beam emitting sections;

a light deflector for deflecting a plurality of light beams emitted respectively from said plurality of light beam emitting sections of said light source;

a scanning optical system for focussing said plurality of light beams deflected by said light deflector on a surface to be scanned; and

a photodetector for controlling [the] a timing of [the] a start of scanning of said plurality of light beams by detecting a part of [at least one of] said plurality of light beams deflected by said light deflector as detection light beams [beam;],

wherein the [said] timing of the start of scanning [being so] is controlled [as] to [make] align the centers of [the] scanning areas of said light beams [agree] with each other on the surface to be scanned while allowing starting points of scanning of said light beams to differ from each other when said plurality of light beams have respective wavelengths that are different from each other.

2. (Amended) A multibeam scanning optical apparatus according to claim 1, further comprising:

a detection optical element for converging said detection light [beam] beams and leading [it] them to said photodetector[;],

wherein said detection optical element [having] has its optical [plane] surfaces arranged orthogonally relative to the detection light [beam] beams.

8. (Amended) A multibeam scanning optical apparatus according to claim 2, further comprising[:]an incident optical system for leading a plurality of light beams emitted from said light source to said optical deflector.

12. (Amended) A multibeam scanning optical apparatus comprising:
a light source having a plurality of light beam emitting sections;
a light deflector for deflecting a plurality of light beams emitted respectively from said plurality of light beam emitting sections of said light source;
a scanning optical system for focussing said plurality of light beams deflected by said light deflector on a surface to be scanned;
a photodetector for controlling [the] a timing of [the] a start of scanning of said plurality of light beams by detecting a part of [at least one of] said plurality of light beams deflected by said light deflector as detection light [beam] beams; and
a detection optical element for converging said detection light [beam] beams and leading [it] them to said photodetector[;],

wherein said detection optical element [having] has its optical [plane]
surfaces arranged orthogonally relative to said detection light [beam] beams.

18. (Amended) A multibeam scanning optical apparatus according to claim
12, further comprising[:] an incident optical system for leading a plurality of light beams
emitted from said light source to said optical deflector.

19. (Canceled)

20. (Canceled)

21. (Canceled)

22. (Canceled)

23. (Canceled)

24. (Canceled)

25. (Canceled)

26. (Canceled)

27. (Canceled)

28. (Canceled)

29. (Canceled)

30. (Canceled)

31. (Canceled)

32. (Canceled)

33. (Canceled)

34. (Canceled)

35. (Canceled)

36. (Canceled)

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Attorney Docket No.: 35.C14341

37. (Canceled)

38. (Canceled)

39. (Canceled)

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